CONCEPT

Industrial Electronics Troubleshooting: Board-Level Fault-Finding and PCB Repair

19 – 23 April 2027
Paris - Right Bank business hotel



Industrial Electronics Troubleshooting: Board-Level Fault-Finding and PCB Repair

Ref: 704_18990 **Date:** 19 – 23 April 2027 **Location:** Paris - Right Bank business hotel **Fees:** 23500 SAR

Introduction:

Industrial electronics troubleshooting decides whether a failed drive card, power supply or I/O module returns to service within hours or waits weeks for a spare that may no longer be made. Plants lose output when boards are swapped by guesswork, damaged by static or poor soldering, and returned without any record of what failed. This Core Concept course trains instrument, electrical and electronics technicians and engineers to read board schematics, measure with the right instrument, isolate the failed component and rework it safely. Each participant completes a Board-Level Fault-Finding and Repair Report.

Course Objectives:

- Identify component packages and predict their typical failure modes from schematics, board layouts and reference designators
- Select and operate the multimeter, oscilloscope, component tester and thermal camera to isolate a faulty stage without further damage
- Diagnose linear and switch-mode power supply faults, including capacitor ESR rise and shorted switching transistors
- Test diode bridges, thyristors, IGBT modules and gate drivers used in rectifiers and power converters
- Trace faults through analogue and digital I/O cards and sensor signal chains, then rework parts inside an electrostatic protected area
- Decide whether to repair or replace obsolete boards and record each repair in a failure history log

Target Audience:

- Instrument technicians who maintain transmitter, I/O and controller cards on process plant
- Electrical technicians who service power supplies, rectifiers and converter electronics
- Electronics workshop staff who repair returned boards at component level
- Maintenance engineers who approve board repairs, spares holdings and repair-or-replace choices
- Shift technicians who carry out first-line fault-finding on panels and control cabinets

Course Outline:

Day 1: Electronic Components, Failure Modes and Board Documentation

- Passive Component Failure Modes: Resistor Drift, Electrolytic Capacitor ESR Rise and Inductor Saturation
- Semiconductor Failure Modes: Diode, Bipolar Transistor and MOSFET Shorts and Opens
- Through-Hole and Surface-Mount Package Identification and Marking Codes
- Schematic Symbols, Reference Designators and Silkscreen Cross-Referencing
- Multi-Layer Board Layout Reading: Tracks, Vias, Ground Planes and Test Points

Day 2: Test Instruments and Systematic Fault-Finding Methods

- Digital Multimeter Techniques: Diode Test, Continuity and Millivolt Drop Along Tracks
- Oscilloscope Setup: Probe Compensation, Triggering and Isolated Differential Measurement
- Component Tester and Analogue Signature Analysis on Unpowered Boards
- Thermal Camera Hot-Spot Location on Powered Boards
- Half-Split, Signal Injection and Known-Good Board Comparison Methods

Day 3: Power Supply and Power Semiconductor Fault-Finding

- Linear Regulator Supply Faults: Ripple, Dropout and Thermal Shutdown Checks
- Switch-Mode Supply Topologies: Buck, Boost and Flyback Stage Tracing
- Switch-Mode Supply Faults: Dried Capacitors, Shorted Switching Transistors and Start-Up Circuit Failure
- Diode Bridge and Thyristor Testing in Phase-Controlled Rectifiers
- IGBT Module and Gate Driver Checks: Static Tests, Snubbers and Optocoupler Isolation

Day 4: I/O Cards, Sensor Signal Chains, ESD Control and Rework

- Analogue Input Card Faults: 4-20 mA Loop Burden, Input Protection and ADC Reference Checks
- Digital Input and Output Card Faults: Optocouplers, Relay and Transistor Outputs
- Sensor Signal Chain Tracing: Thermocouple, RTD and Bridge Amplifier Stages
- Electrostatic Protected Area Setup: Wrist Straps, Dissipative Mats, Ionisers and Shielding Bags
- Soldering, Desoldering and Hot-Air Rework of Through-Hole and Surface-Mount Parts

Day 5: Repair Decisions and Board-Level Fault-Finding Lab

- Obsolete Board Repair-Versus-Replace Decision Matrix: Spares, Lead Time and Reverse Engineering Risk
- Faulty Card Lab: Symptom Record and Measurement Plan
- Fault Isolation Lab: Component Replacement, Joint Inspection and Powered Re-Test
- Repair Record and Failure History Log for Recurring Board Faults
- Board-Level Fault-Finding and Repair Report Drafting and Peer Review

Skills You Will Gain:

- Component Failure Mode Recognition
- Board Layout Interpretation
- Oscilloscope Measurement
- Switch-Mode Supply Diagnosis
- Power Semiconductor Testing
- Signal Chain Tracing
- ESD-Safe Handling
- Surface-Mount Rework

Why Attend This Course:

- Return with a Board-Level Fault-Finding and Repair Report built on a faulty card worked on the bench
- Bring failed drive, supply and I/O boards back into service instead of waiting for scarce spares
- Stop repeat failures caused by static damage, overheated pads and undocumented component swaps
- Compare bench repair practice with technicians from oil and gas, utilities, water, cement and manufacturing plants

Conclusion:

Board repair works when every measurement is planned, every stage is isolated in order and every change is recorded. The week moves from component failure modes and board documentation, through test instruments and fault-finding methods, to power supplies and power semiconductors, then to I/O cards, sensor signal chains, static control and hand rework. On the final day participants diagnose a faulty card on the bench and complete a Board-Level Fault-Finding and Repair Report ready for their maintenance team.